Applying a Developmental Perspective to Aquatics and Swimming

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Most typically in the aquatic field instructors and coaches employ an "error correction model" to view all swimming behaviours. Using a "straw person" approach, clinicians expect all learners regardless of age or skill to swim like an elite adult swimmer. In this approach errors are corrected mainly when external experts such as teachers or coaches expunge those errors using command style direct teaching. In command teaching, a coach verbally describes and then demonstrates the expected "expert" way of swimming followed by identifying the "errors" the learner makes that deviate from the expert model. In contrast, a "developmental perspective" is defined as a view in which one expects and anticipates regular, ordered changes to occur in swimming behaviours across the entire lifespan. From a developmental perspective, changes in swimming behaviour occur as a result of systemic interactions among individual, task, and environmental characteristics as proposed by Newell (1986). For example, this view expects that someone learning to swim on the front gradually and systematically will change the arm, leg, and breathing patterns they use to move through the water because their body size or density changes, or the way they interact with the task is altered. In this paper I provide a conceptual overview that compares and contrasts the developmental and error correction approaches in swimming by drawing upon contemporary thinking in dynamical systems and motor development theory. In particular, I highlight the three essential clinical skills that aquatic clinicians need to possess when using "developmentally appropriate practices" (DAP) (i.e., developmental assessment, individualization of instruction, and developmental task analysis). For each DAP clinical skill, I provide practical illustrations for how these DAP skills apply to learning in aquatics and swimming. I argue that the predominance of the error correction model within swimming and aquatics has severely limited the field's acceptance and use of best instructional, learning, and assessment practices as well as unnecessarily constrained thinking about swimming skill acquisition in ways that acceptance of a developmental perspective would remedy.

Keywords: swimming skill acquisition, developmental perspective, developmentally appropriate practices, developmental task analysis

INTRODUCTION

Virtually all authors and practitioners in the aquatics field approach the acquisition of skill from what is known as an "error correction model." From this ubiquitous "error model," practitioners view swimming skills from an "all or nothing" perspective in which they expect a single "correct" way of performing each aquatic skill. Regardless of a swimmer's age, skill level, or ability, or the task goal and environment, instructors presume the "right way" to perform any aquatic skill is to match the way a hypothetical elite adult swimmer would perform it.

Because of the presumption under the error model that there is a single right way to perform a skill, the aquatic skill acquisition process becomes one of expunging errors. Expunging errors mainly creates a negative, or "glass-half-full," approach especially for young, inexperienced, or differently-abled learners. The primary view is that these individuals are wrong in how they are trying to swim. Even if they make a single change, they are still not swimming the "correct" way which can be quite frustrating for a young or inexperienced learner. The error model also tends to engender a single direct pedagogical approach, often called "command style," or "tell-show-do," teaching (Mossten, 1966).

This paper proposes that an alternative way of viewing skill acquisition known as the developmental perspective provides a number of advantages to both practitioners and learners. Under the developmental perspective practitioners presume that all voluntary motor skills including swimming skills change gradually over time as a result of a number of complex interactions among individual learners, tasks being learned, and the environmental context. As a more positive and hopeful means of promoting skill acquisition, the developmental perspective understands that motor skills may take on a variety of coordination patterns. These different patterns are acquired in a regular, but gradual, sequence of changes. Developmentally, the different patterns are not viewed as right or wrong, or correct vs. incorrect, but only as less or more developmentally advanced along a developmental continuum as illustrated in Figure 1.

Figure 1.

In facilitating learning, the developmental perspective encourages practitioners to use a much more diverse set of learner-centered teaching and learning approaches instead of just the direct command style implied by the error model. For example, instructors may use indirect teaching-learning approaches such as movement exploration, guided discovery, or task setting (Mossten, 1966). The developmental perspective also provides the opportunity for more diagnostic and prescriptive formative assessment to individualize their teaching (Langendorfer & Bruya, 1995).

METHOD

I argue in this paper for the wider adoption of the developmental perspective over the error correction model in the teaching and coaching of swimming, water safety, and aquatic skills. My argument is not based upon a single empirical study, but draws upon a variety of existing developmental studies and expository articles, both terrestrial and aquatic, that contrast with the observed weaknesses of the error model. I also propose applying several unique developmental approaches to the aquatic field as a means for expanding the repertoire or tool box skills of aquatic practitioners.

The first unique element that has not previously been applied to aquatics is Newell's (1986) constraints model. The constraints model draws upon contemporary dynamical systems theory. Newell (1986) uses a triangle as a simple metaphor to portray how swimming coordination patterns may vary according to relationships, called *constraints*, among an individual, the task goal, and environmental context (see Figure 2). For example, as an individual swimmer grows or gets stronger, the way she swims a front crawl (or freestyle) stroke gradually changes the arm pull, leg kick, or body position because her size and fitness enable her to interact within the water environment differently than when she was smaller and less fit. Similarly, the constraints model proposes that if an instructor alters characteristics of the front crawl stroke (e.g., how far, how fast; added buoyancy), the crawl pattern also may change. Teaching can influence the swimming skill not because the swimmer does what a teacher demonstrates or instructs, but because the instructor manipulates the task goal (e.g., speed, stroke length) or characteristics of the environment (e.g., water temperature, depth).

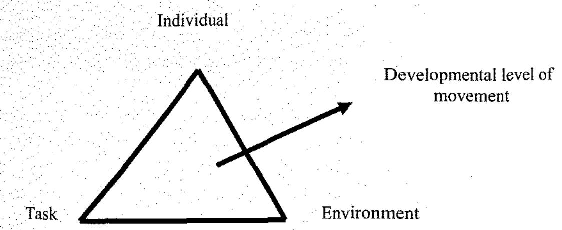

Figure 2.

A second unique element to apply to aquatics is a concept called *developmentally appropriate practices*, also known as DAP (Bredekamp, 1987). I propose for our purposes that we modify this concept and call it DAAP, or developmentally appropriate aquatic practices, to emphasize how we can apply this early childhood educational concept to the teaching-learning of aquatics across the lifespan.

Roberton (1993) proposed that we should define DAP as the process of identifying where an individual falls along a lifespan developmental continuum and matching tasks to the needs and readiness of each individual. In order to accomplish Roberton's definition of DAP, she suggests that practitioners need to acquire three distinct developmental skills. Practitioners need 1) to possess developmental assessment skills by using developmental sequences, 2) to appreciate how to individualize instruction, and 3) to know how to make tasks easier or harder, depending upon the needs of the individual.

Developmental assessment. Employing developmental aquatic assessment skills requires practitioners to reject the error correction model assumption that there is one correct way to perform a skill and appreciate that all swimming skills change in regular, ordered sequences. Several developmental aquatic assessment instruments have been published (Erbaugh, 1978; Langendorfer & Bruya, 1995). They represent using aquatic developmental sequences to identify where along a developmental continuum a swimmer's skill or stroke falls.

Individualizing instruction. Individualizing how one provides instruction requires a shift away from the traditional "one-size-fits-all" teacher-centered techniques to focusing on the needs of each learner. Learner-centered teaching focuses on helping each swimmer to move from where she is to being more advanced. Generally this means that a practitioner needs to employ more indirect teaching techniques such as exploration, guided discovery, or task setting (Mossten, 1966). It also requires the use of developmental assessment to determine each swimmer's developmental level.

Making tasks easier or harder. The third developmental skill for structuring an appropriate aquatic environment is the recognition that, in line with Newell's (1986) constraints model, task performances change according to their relationship to the complexity of the task. One very simple means for systematically varying task complexity uses *developmental task analysis*, or DTA (Herkowitz, 1978; Morris, 1976; Roberton, 1989). One variation on DTA includes constraints-based task analysis (Haywood & Getchell, 2009). Each of these techniques create a structure by which task factors can be systematically altered as the primary means for changing the coordination patterns of aquatic skills (see Table 1).

RESULTS

In this section, I provide several explicit examples of how to employ Roberton's proposed skills for DAAP within an aquatic instructional program to facilitate optimal learning under a developmental perspective. In doing so, I reference Newell's constraints model and one version of an aquatic DTA. Where appropriate, I contrast how the developmental perspective differs from the error correction approach.

I propose to use a hypothetical example of a mixed age (from 7 to 20 years old) class of 15 swimmers who all desire to learn how to swim the front crawl stroke. I purposefully have chosen a class with somewhat extreme age differences to illustrate how DAAP should work regardless of diversity. I also want to illustrate the common fallacies associated with homogeneous grouping of swimmers that so often is mistakenly applied to swimming instruction.

Developmental assessment. The first step that needs to be taken with our hypothetical class is to identify the swimming skill levels of each class member on a variety of swimming skills prerequisite to front crawl swimming. For this purpose, I use the *Aquatic Readiness Assessment* (ARA) (Langendorfer & Bruya, 1995) because the ARA is comprised of nine components, each representing developmental sequences relating to front (or prone) swimming. The components allow me to developmentally assess the comfort level of each class member in the water, their skills in entering the water, floating, submerging, controlling their breathing, and moving on their front in the water using arms, legs, and an appropriate body position.

I complete a separate ARA assessment form for each class member during the first session of the class. Since each ARA component represents a developmental sequence, I am able to diagnose each swimmer's levels along a developmental continuum (see Figure 1) and prescribe what levels they needed to work toward next.

Individualizing instruction. Between the first and second class sessions, I create an *individualized aquatic education plan* (I.A.E.P) for each class member, identifying their current developmental levels, any contraindications, short term goals, and longer term goals based on feedback from each person. At the second class session, each member receives a copy of their own I.A.E.P. with notes about suggested skills to work on.

During subsequent class sessions, the pool is set up with learning stations complete with laminated task cards containing both verbal and pictorial instructions. Each swimmer's I.A.E.P. indicates the next levels on which s/he needs to work and links those to selected learning stations. Swimmers work in pairs and small groups at stations to assist each other and do peer review. As instructor, I provide the general focus of stations for that session, rotate among stations to clarify tasks, provide assistance and feedback, and direct instruction as needed by individuals. I also do spot assessments to update I.A.E.P.s as needed.

Making tasks easier or harder. One of the primary mechanisms I use to structure DAAP tasks at each learning station is an aquatic developmental task analysis (DTA). I create separate DTAs with factors appropriate to each skill. Note in the DTA in Table 1 that complexity is related directly to characteristics of the individual, or body-scaled. This normalization negates the need to try to achieve a homogenous grouping because each task is scaled to the individual's capabilities. For example, water depth and distance swum are described in terms of the height of each individual, not in absolute distance units such as centimeters or meters.

Table 1. A proposed aquatic developmental task analysis.

Swim Factors → / Complexity	Water depth	Distance to be swum	Support	Assistance	Equipment
Easy (simple) ↓	Waist deep	1-2 body lengths	One or more flotation aids	Full assist by practitioner	Propulsive equipment
	Chest deep	2-5 body lengths	Natural body buoyancy	Partial assist by practitioner	No equipment used
Hard (difficult)	Deeper than standing height	10 body lengths or more	Attached weight	No assistance	Resistive equipment

DISCUSSION

I propose that my hypothetical class in which learning to swim front crawl stroke is approached from a developmental perspective and employing the three D.A.A.P. skills proposed by Roberton (1993) appears to be rather different in a number of ways than a similar class organized according to an error correction model. Those ways include the use of formative assessment, I.A.E.P.s, need-based lesson planning, individualized learning stations, and structuring learning tasks using aquatic developmental task analysis.

Under the typical error correction model, assessment is primarily summative in nature. It typically occurs during the final session, not the first session. When it does occur formatively, feedback is in the form of the "errors" that the swimmer is committing, not diagnostic corrective feedback about what the swimmer already can do and what s/he needs to do next. The I.A.E.P. allows the formative assessment using the ARA to be translated individually for each class member and allows them to work on the specific developmentally appropriate next levels.

The learning station approach employed in my hypothetical class is learner-centered and allows each member to take responsibility for her or his own learning while the instructor serves as a facilitator, not the primary instrument for demonstrating the right way to perform each skill. Each individual can work on those skills that they should master next. In contrast, a typical error model class would all be working on the same skills regardless of their individual needs.

The presence of aquatic DTAs allows both swimmers and instructors to create a multitude of learning activities that they might otherwise not create without a DTA. It is noteworthy that the relatively simple DTA in Table 1 with only 5 factors each with 3 levels of complexity allow 243 different and unique learning situations that few if any instructors might create under an error correction model.

CONCLUSIONS

This paper compares and contrasts the developmental perspective with a more typical error correction model, identifying significant ways that developmentally appropriate practices can individualize acquisition of swimming, water safety, and aquatic skills. It introduces Newell's (1986) constraints model and Roberton's three DAP instructional skills required of swimming practitioners for employing a developmental perspective.

REFERENCES

Bredekamp, S. (1987). *Developmentally appropriate practices in early childhood education.* Washington, DC: National Association for the Education of Young Children.

Erbaugh, S.J. (1978). Assessment of swimming performance of preschool children. *Perceptual and Motor Skills, 47,* 1179-1182.

Haywood, K.M., & Getchell, N. (2009). *Life Span Motor Development.* Champaign, IL: Human Kinetics.

Herkowitz, J. (1978). Developmental task analysis: The design of movement experiences and evaluation of motor development status. In M. Ridenour (Ed.), *Motor development: Issues and applications* (pp. 139-164). Princeton, NJ: Princeton Book Co.

Langendorfer, S.J., & Bruya, L.D. (1995). *Aquatic readiness: Developing water competence in young children.* Champaign, IL: Human Kinetics.

Morris, G.S.D. (1976). *How to change the games children play* Minneapolis: Burgess.

Mossten, M. (1966). *Teaching from command to discovery.* Columbus, OH: Merrill.

Newell, K.M. (1986). Constraints on the development of coordination. In M.G. Wade & H.T.A. Whiting (Eds.), *Motor development in children: Aspects of coordination and control* (pp. 341-360). Dordrecht, Netherlands: Matinus Nijhoff Publishers.

Roberton, M.A. (1989). Developmental sequence and developmental task analysis. In J. Skinner et al. (Eds.), *Future directions in exercise and sport science research* (pp. 369-381). Champaign, IL: Human Kinetics.

Roberton, M.A. (1993). *Developmentally appropriate practices.* Presentation to the Midwest Association for Health, Physical Education, Recreation, and Dance. Toledo, Ohio.

Roberton, M.A., & Halverson, L.E. (1984). *Developing children – their changing movement.* Philadelphia: Lea & Febiger.

The Psycho-Physiology of Overtraining and Athlete Burnout in Swimming

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Understanding swimmers' response to training and competition continues to be a significant challenge. Although a great deal of research has previously attempted to better understand the psychological and physiological factors leading to maladaptive training responses in an elite swimmer population, very few attempted to integrate these two fundamental perspectives. Therefore, the aim of this study was to investigate the relationship between personal dispositions, contextual motivation factors, subjective performance satisfaction, hormonal variation and burnout in elite swimmers. 53 elite swimmers (F=21, M=32) participated in a protocol of 6x200m progressive intervals during morning (07.00-08.30) and afternoon (14.00-15.30) training sessions. Venous blood was drawn before and after each sets of intervals and was analyzed for adrenocorticotropic hormone (ACTH) and cortisol by radio immune assays. This protocol was used at three time points during the season, corresponding to the easy, very hard and peaking time periods of the swimming season. Questionnaires assessing psychological variables were used together with the two-bout exercise test at three time points during the season. Using hierarchical regression analysis, results indicated that variation in basal cortisol (15%), maladaptive perfectionism disposition (20%), perceived mastery motivational climate (12%) and subjective performance satisfaction explained together a total of 67% of the variance in athlete burnout at season's end. Hormonal monitoring is costly and invasive, current findings support the initial use of psychological monitoring, while hormonal monitoring may be used as a second step to help athletes steer away from maladaptive training outcomes such as athlete burnout.

Key words: overtraining, burnout, prevention, hormones, motivation

INTRODUCTION

Elite swimmers are exceptionally gifted individuals born with the physiology to excel in their respective discipline. Typically, they are highly motivated and dedicated to training and reaching very high goals. This determination helps them persevere through the most demanding workouts and survive harsh training conditions. These qualities and the high commitment involved in being a high performing swimmer have raised these swimmers to the level of elite performances. However, when facing frustrating setbacks, the same exact qualities that have elevated them elite performance may become their worst enemies and lead to overtraining (Hall, Cawthraw, & Kerr, 1997). Resulting in long term decrement of performance capacity, an overtraining state originates from a long lasting imbalance between training and recovery. Restoration may take several weeks or months (Kreider, Fry, & O'Toole, 1998). After some time, swimmers may get used to the new state of tiredness and adjust to feeling tired all the time. Elite swimmers experiencing enduring physiological and/or psychological exertion, without significant recovery or achieving the desired goal, may develop athlete burnout. Burnout has been defined as a state of mental, emotional, and physical exhaustion (Freudenberger, 1980) brought on by persistent devotion to a goal, without recognizing the need to recuperate, in the quest for a goal that may be opposed to reality.

Recently, as inter-disciplinary research has taken a closer look at athlete burnout, some researchers (Gould, 1996; Hall & al., 1997; Lemyre, Hall, & Roberts, 2007) have suggested that "motivation gone awry" may play an important role in the onset of burnout. The focus of the present research is to investigate this hypothesis. We adopted contemporary social-cognitive motivational theory as our conceptual base for this study. From a motivational viewpoint, it is clear that swimmers have many